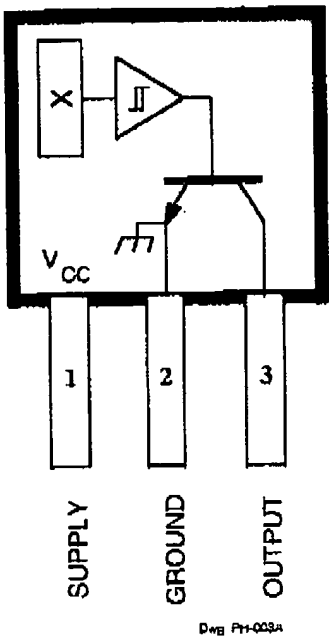
# 3134

Data Sheet 27631.4B

## BIPOLAR HALL-EFFECT SWITCH FOR HIGH-TEMPERATURE OPERATION




Pinning is shown viewed from branded side.

### ABSOLUTE MAXIMUM RATINGS at $T_A$ = +25°C

| | |
|---|---|
| Supply Voltage, $V_{CC}$ | 30 V |
| Reverse Battery Voltage, $V_{RCC}$ | -30 V |
| Magnetic Flux Density, B | Unlimited |
| Output OFF Voltage, $V_{OUT}$ | 30 V |
| Reverse Output Voltage, $V_{OUT}$ | -0.5 V |
| Continuous Output Current, $I_{OUT}$ | 25 mA |
| Operating Temperature Range, $T_A$ | |
| Suffix 'E–' | -40°C to +85°C |
| Suffix 'L–' | -40°C to +150°C |
| Storage Temperature Range, $T_S$ | -65°C to +170°C |

This low-hysteresis bipolar Hall-effect switch is an extremely temperature-stable and stress-resistant sensor especially suited for operation over extended temperature ranges to +150°C. Superior high-temperature performance is made possible through a novel Schmitt trigger circuit that maintains operate and release point stability by compensating for temperature changes in the Hall element. Additionally, internal compensation provides magnetic switch points that become more sensitive with temperature, hence offsetting the usual degradation of the magnetic field with temperature. Its low hysteresis makes this device ideal for detecting small changes in magnetic field strength or for use with inexpensive magnets.

The device includes on a single silicon chip a voltage regulator, quadratic Hall-voltage generator, temperature compensation circuit, signal amplifier, Schmitt trigger, and a buffered open-collector output to sink up to 25 mA. The on-board regulator permits operation with supply voltages of 3.8 volts to 24 volts.

The first character of the part number suffix determines the device operating temperature range. Suffix 'E–' is for -40°C to +85°C, and suffix 'L–' is -40°C to +150°C. Three package styles provide a magnetically optimized package for most applications. Suffix '–LT' is a miniature SOT-89/TO-243AA transistor package for surface-mount applications; suffix '–U' is a three-lead plastic mini-SIP while suffix '–UA' is a three-lead ultra-mini-SIP.

### FEATURES

- Superior Temperature Stability
- Operation From Unregulated Supply
- Open-Collector 25 mA Output
- Reverse Battery Protection
- Activate With Small, Commercially Available Permanent Magnets
- Solid-State Reliability
- Small Size
- Resistant to Physical Stress

Always order by complete part number, e.g., **A3134ELT** .

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# 3134
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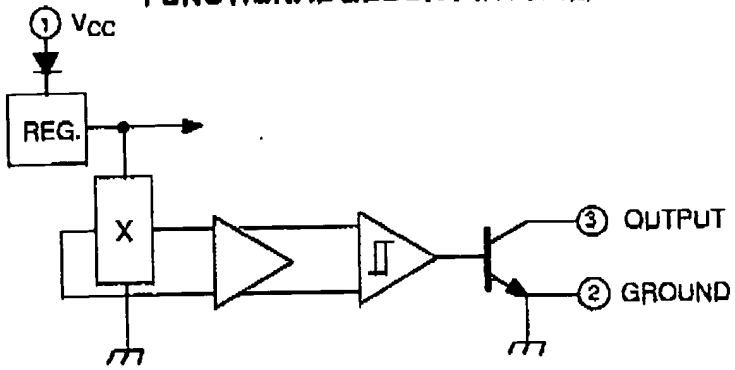
**FUNCTIONAL BLOCK DIAGRAM**




Dwg. FH-005-3

**ELECTRICAL CHARACTERISTICS over operating temperature range, at $V_{CC}$ = 12 V.**

| Characteristic | Symbol | Test Conditions | Limits | | | |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | Units |
| Supply Voltage | $V_{CC}$ | Operating | 3.8 | — | 24 | V |
| Output Saturation Voltage | $V_{OUT(SAT)}$ | $I_{OUT}$ = 20 mA, B > $B_{OP}$ | — | 175 | 400 | mV |
| Output Leakage Current | $I_{OFF}$ | $V_{OUT}$ = 24 V, B < $B_{RP}$ | — | 0.05 | 1.0 | µA |
| Supply Current | $I_{CC}$ | B < $B_{RP}$ (Output OFF) | — | 3.2 | 9.0 | mA |
| | | B > $B_{OP}$ (Output ON) | — | 5.0 | — | mA |
| Output Rise Time | $t_r$ | $R_L$ = 820 Ω, $C_L$ = 20 pF | — | 100 | — | ns |
| Output Fall Time | $t_f$ | $R_L$ = 820 Ω, $C_L$ = 20 pF | — | 100 | — | ns |

**MAGNETIC CHARACTERISTICS over operating supply voltage range.**

| Characteristic | Symbol | Test Conditions | Limits | | | |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | Units |
| Operate Point | $B_{OP}$ | at $T_A$ = +25°C | -40 | 8.5 | 50 | G |
| | | Over Oper. Temp. Range | -40 | – | 50 | G |
| Release Point | $B_{RP}$ | at $T_A$ = +25°C | -50 | -19 | 40 | G |
| | | Over Oper. Temp. Range | -50 | – | 40 | G |
| Hysteresis | $B_{hys}$ | at $T_A$ = +25°C | 10 | 27 | 50 | G |
| | | Over Oper. Temp. Range | 5.0 | – | 55 | G |

NOTES: $B_{OP}$ = operate point (output turns ON); $B_{RP}$ = release point (output turns OFF), $B_{hys}$ = hysteresis ($B_{OP}$ - $B_{RP}$).
As used here, negative flux densities are defined as less than zero (algebraic convention)
Typical values are at $T_A$ = +25°C and $V_{CC}$ = 12 V.

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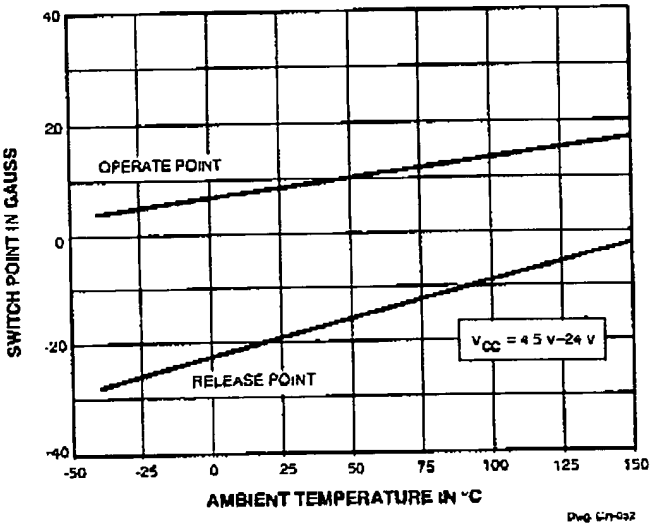
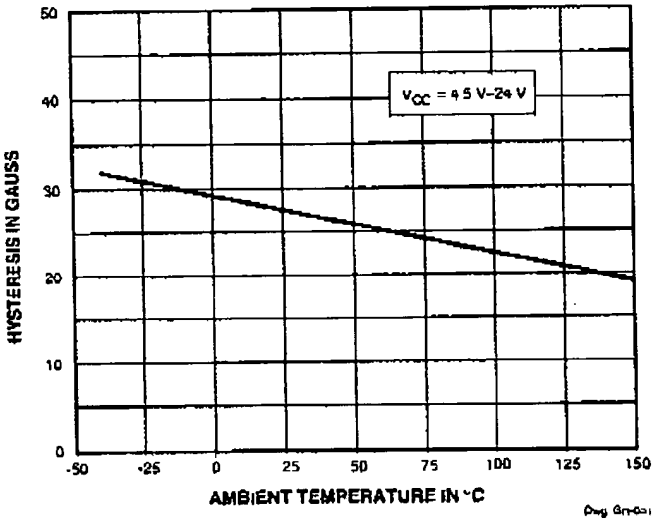
## TYPICAL OPERATING CHARACTERISTICS

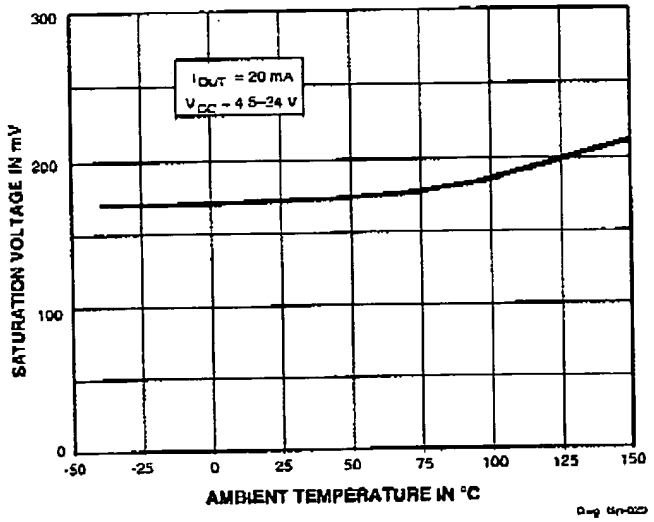
### SWITCH POINTS



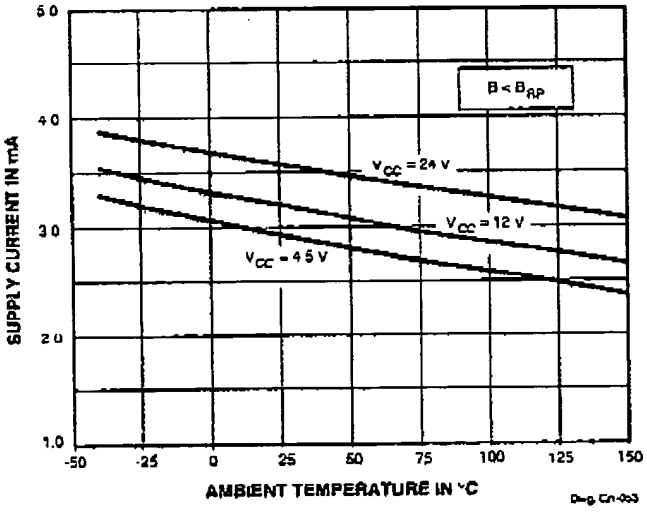

### HYSTERESIS




### OUTPUT SATURATION VOLTAGE




### SUPPLY CURRENT



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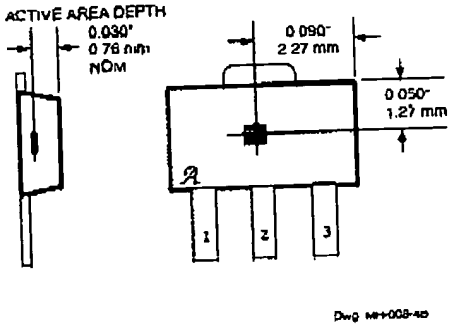
## SENSOR LOCATIONS
(±0.005" [0.13 mm] die placement)

**Suffix "LT"**

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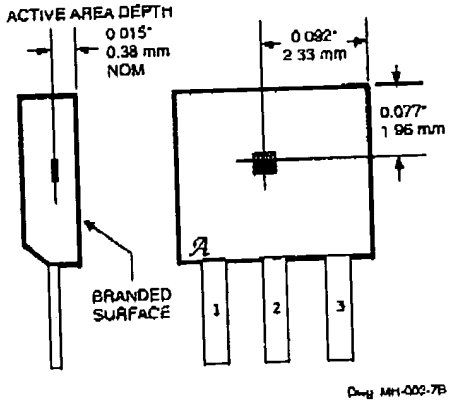
**Suffix "U"**

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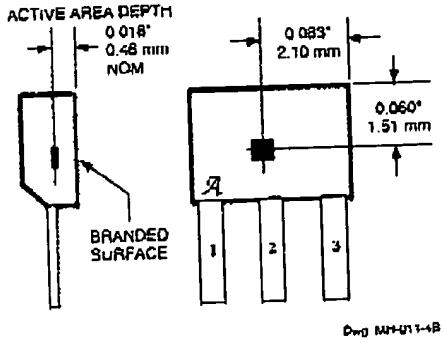
**Suffix "UA"**

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## APPLICATIONS INFORMATION

Hall effect applications information is available in the "Hall-Effect IC Applications Guide" (AN 27701), which can be found in the latest issue of *Allegro MicroSystems Electronic Data Book*, AMS-702, or at www.allegromicro.com

## OPERATION

The output of these devices (pin 3) switches low when the magnetic field at the Hall sensor exceeds the operate point threshold ($B_{OP}$). At this point, the output voltage is $V_{OUT(SAT)}$. When the magnetic field is reduced to below the release point ($B_{RP}$) the device output goes high. Note especially that release can occur when the magnetic field is removed but to ensure release, a field reversal is required. The difference in the magnetic operate and release points is called the hysteresis ($B_{hys}$) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise

Allegro MicroSystems, Inc
115 Northeast Cutoff, Box 15036
Worcester, Massachusetts 01615-0036 (508) 853-5000